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BEFORE THE
COMMITTEE ON SCIENCE, U.S. HOUSE OF REPRESENTATIVES
ON
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION ORGANIC LEGISLATION AND RESEARCH REVIEW

JULY 15, 2004

Good afternoon, Mr. Chairman and members of the Committee. Thank you for the opportunity to discuss pending legislation and reports relating to the organization and research programs of the National Oceanic and Atmospheric Administration (NOAA). I am Rear Admiral Dick West, President of the Consortium for Oceanographic Research and Education (CORE). I am speaking today on behalf of the 78 member institutions of CORE who work together to develop and promote a common vision and goals for the ocean science community. In addition and as a member of the NOAA Research Review Team, your invitation asked me to provide a brief summary of the team's report and recommendations.

I. CORE VIEWS ON H.R. 4546, THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION ACT, AND H.R. 4607, THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION ACT OF 2004

CORE was established a decade ago to promote and advance ocean science research and education. As an organization, CORE fosters membership of U.S. institutions actively involved in ocean research and education; seeks support for the development of partnerships in oceanographic research and education; builds critical links among government agencies, academia and marine industries; and actively works with policy and decision makers on ocean research and education issues. Our membership includes the leadership of this nation's premier ocean science institutions.

With the U.S. Commission on Ocean Policy nearing completion of its work, this has truly been an extraordinary year for the entire ocean science community. On one hand, we are looking forward to the first comprehensive report on national ocean policy in more than 35 years – one that will identify both serious problems and exciting new opportunities. On the other hand, this compelling document is being released in the waning days of the 108th Congress as our nation faces war, presidential and congressional elections, and difficult fiscal decisions to meet tight budget constraints. In response to the challenges posed by the Commission report, the oceanographic community has adopted two strategies: The first is to make sure that Americans understand the critical role of the oceans in our environmental, economic and national security. The second is to strengthen policies and investment of resources commensurate with the importance of the oceans in our lives.

As we pursue these strategies and work to implement the Commission recommendations, CORE would like to thank the members and staff of the Science Committee for their

leadership and continued attention to ocean science issues. In particular, we appreciate Congressman Ehlers' willingness to sponsor legislation and move forward quickly to put the Commission's findings in place. This is a very timely and important hearing given the nature and scope of the proposals being discussed.

The ocean science community supports efforts to enact NOAA organic legislation and is optimistic that it will provide NOAA with tools needed to define a common, agency-wide vision. The legislation offers a unique opportunity to codify NOAA's structure and function and set the direction for creating a unified and integrated organization. CORE, the Sea Grant Association, and the National Association of State Universities and Land Grant Colleges jointly have endorsed H.R. 4546. Attached to my written statement is a copy of our support letter.

Ocean Commission Recommendations and NOAA

In 1969, the report of the Commission on Marine Science, Engineering, and Resources (Stratton Commission) recommended "the creation of a major new civilian agency, which might be called the National Oceanic and Atmospheric Agency, to be the principal instrumentality within the Federal Government for administration of the Nation's civil marine and atmospheric programs." The report also suggests that the primary mission of the new agency be "to ensure the full and wise use of the marine environment in the best interests of the United States." It proposes 18 functions ranging from advancing the marine and atmospheric sciences to assuring the availability of educated and trained manpower. Less than a year later, the President's Reorganization Plan No. 4 of 1970 created NOAA, consolidating many of the civilian oceanic and atmospheric programs that were scattered throughout the federal bureaucracy.

Unfortunately, NOAA still exists today as an amalgamation of research, operational, and regulatory entities that do not operate under a common and well-integrated corporate culture. The current fragmented structure stems in large part from the way in which NOAA was assembled from existing federal marine, weather and atmospheric entities, then awkwardly placed within the Department of Commerce. Through the 1970 reorganization plan, NOAA became the uneasy sum of several competent, yet independent-minded organizations that still have not melded into a single cohesive agency.

Thirty-five years have passed since the Stratton Commission finished its work and now the Watkins Commission is preparing to issue its final report. One of the preliminary recommendations of today's Commission is very similar to that of its predecessor. It states, "Congress should pass an organic act that codifies the establishment and missions of the National Oceanic and Atmospheric Administration. The act should ensure that NOAA's structure is consistent with the principles of ecosystem-based management and with its primary functions of assessment, prediction, and operations; management; and research and education." The situation is also similar in that the Administration and Congress have responded quickly by taking action, in this case through the introduction of H.R. 4546 and H.R.4607 to implement Commission recommendations.

Of course, the Commission recommendations related to NOAA are not limited to the call for organic legislation. Of the Commission's almost 200 recommendations, nearly a quarter are directed toward NOAA . Among those of significance for today's NOAA discussion are the following:

- Doubling the federal ocean and coastal research budget over the next five years, from the 2004 level of approximately $650 million to $1.3 billion per year, including enlargement of the National Sea Grant College Program, and support for other research identified as high priorities. (25-1)
- Expanding the national ocean exploration program under NOAA and the National Science Foundation and with involvement of other federal ocean agencies. (25-4)
- Serving as the lead federal agency for funding, implementing and operating the Integrated Ocean Observing System (IOOS) with distribution of funds through a streamlined process to federal and nonfederal partners. (26-2,9)
- Strengthening support for both formal and informal ocean-related education at NOAA and other agencies, including support for an education office, teacher development opportunities, undergraduate marine science courses, a national ocean workforce database, participation of traditionally underrepresented groups and a traineeship program patterned after the National Institutes of Health. (8-3,7,9,11,12,15)
- Creating a NOAA organization to support transition of research technologies into operations and increasing investment in research programs to assess and develop effective technologies for dealing with issues like vessel pollution, protected species interactions, aquaculture, and ocean observations. (16-4, 20-7, 22-3, 26-7, 27-2)
- Expanding research and development efforts, including competitively awarded grants and support of federally designated centers, by NOAA and other agencies for multidisciplinary studies of marine species and potential marine bio-products; expanded research in marine microbiology and virology; and improved methods for monitoring and identifying pathogens and chemical toxins in ocean waters and organisms. (23-1,2,3)

Organic Act Legislation

Following introduction, CORE circulated H.R. 4546, the National Oceanic and Atmospheric Administration Act, and H.R. 4607, the National Oceanic and Atmospheric Administration Act of 2004, to its members for review. Both bills include NOAA organic legislation and it seems clear that H.R. 4546 fundamentally is not in conflict with H.R. 4607 but expands upon it significantly in important ways. H.R. 4546 is a clear step forward for NOAA and CORE members are generally very supportive. There are a few issues, however, that raise questions and we would like to work with you to resolve them as the Committee moves the bill through the legislative process.

One preliminary question is that H.R. 4546 authorizes some specific research programs addressed by the Commission report but not others. We recognize that the bill was not intended to be exhaustive. However, it may be useful to consider including or expanding

authorizations for other education and research efforts, such as the National Sea Grant College Program, the National Undersea Research Program and ocean exploration. Stepping back from discussion of specific programs, CORE's principal interest is that NOAA develop balanced research and education programs that are peer-reviewed and competitively awarded, rely on effective partnerships and outreach, support the full breadth of the agency's mission and demonstrate its commitment to scientific excellence.

Returning to H.R. 4546, one key provision is the creation of a new career position, a Deputy Assistant Secretary for Science and Technology. CORE strongly supports the new position and its responsibility for coordinating and managing research activities across the agency. Establishing this position provides clear recognition of NOAA as a science-based agency that has a corporate view of their research program. This recommendation also appears to be consistent with the goals of the Research Review Team. It would, however, be useful to clarify the ability of the science deputy to actively influence science activities and budgets within the line offices, as well as his or her relationship to the NOAA Science Advisory Board. Given the Commission's recommendation that research and education be one program element of a revised NOAA structure, we also would suggest that you make education a specific part of the portfolio of the science deputy.

From our perspective, the Deputy Assistant Secretary for International Affairs also is an important position, especially as we work to develop a global observing system. Consequently, the Committee may wish to consider adding integration of global observing systems specifically to the list of responsibilities for the international position.

CORE strongly supports the authorization for the Science Advisory Committee and the requirement to develop strategic plans for scientific research and for data management, archival and distribution. With respect to data and information systems, the provision related to the global Earth-observing system is particularly important. However, the plan also should address development of services, including reprocessing and algorithms.

With respect to research, NOAA would greatly benefit from a plan that emphasizes the importance of peer-reviewed and competitive awards, improves the process of managing grants and contracts, integrates research and outreach, cuts across agency divisions, clearly defines priorities based on operational requirements and reflects the needs and recommendations of constituent groups at the national, regional, state and local levels. It would be difficult to overstate the importance of longer term, basic research to NOAA's mission and viability. We also should recognize that it is not always possible to reduce uncertainty in projecting climate and other environmental variability. More accurately, our goal should be to increase understanding of the system's complexity in order to develop more robust projections in light of that variability.

Community support through interaction and regular contact with external constituencies is essential to the effectiveness of the agency. Numerous studies have recognized the NOAA-university partnership as a principal means to forge that connection. For this reason, it is essential that the bill include a mechanism for academic, public and other community input into the development and implementation of the NOAA-wide strategic plans for scientific research and data. NOAA should regularly apply the planning models

used by the National Science Foundation and other research agencies, including workshops and other forums to generate NOAA priorities for research, education and outreach. Such community involvement should not be limited to planning stages, but rather be extended to all agency activities.

Effective education and outreach are critical to NOAA missions and CORE applauds H.R. 4546 for explicitly identifying them as NOAA functions. However, it also may be necessary to define specific NOAA education and outreach functions in the section on research and education. In addition, a strategic plan for education should be developed independently or as part of the research plan.

As the bill moves through the legislative process, it will be important to address marine management responsibilities and delineate the relationship of marine management to the programs already defined in sections of the organic act title – weather service, operations and services, and research and education. The bill's programmatic sections are similar to the primary functions identified by the Ocean Commission. However, the bill stops short of recommending changes in the line office structure. The current line office structure is widely viewed as inhibiting NOAA's capability to function effectively as an integrated organization and it is unclear whether NOAA can make major progress towards a more unified operation without such changes. This is a particular concern in dealing with the Commission recommendation to implement ecosystem-based management.

The relationship between research and operational programs and services, including information management, must be considered carefully and work hand-in-hand. NOAA observing activities must be tasked with providing quality data sets that can support fundamental research, which in turn will be used to support new forecasting and prediction services as well as evolution of the observing and information system. We tend to think of science in the service of operations, but in many areas such as climate forecasts and ecosystem-based management, it is a two-way street. It is not a simple matter of a one-way flow of knowledge from science to operations, but rather operations and management programs must be in full partnership with research and technology development. Within NOAA, the operational side must see its success as depending, in part, on its ability to support basic, curiosity-driven research, which will elucidate new concepts and new questions to improve operations and support new management policies. One way to prevent operations and service from being "stove-piped" from research and education is to link them through modeling and analysis conducted jointly.

Authorization of Appropriations

The authorization levels proposed in H.R. 4546 appear to be consistent with maintaining current service levels. One concern that has been raised is that authorized funding for Program Planning and Integration remains constant, despite the increasing need for planning efforts across the agency.

Coastal Ocean Science Program

NOAA's coastal ocean science program has been one of its most successful research efforts, despite funding constraints in recent years. It is a relevant and useful program, whose research objectives should be augmented by access to a fully functioning coastal

ocean observing system. An immediate concern is that the NOAA funding bill that recently was approved by the House of Representatives would slash the funding available for such research activities in fiscal year 2005. We urgently request that the appropriation levels be restored before the funding bill is finalized.

The ocean science community supports renewed interest in research that measures, analyzes and predicts the effects of coastal and Great Lakes pollution. The Watkins Commission clearly recognizes the rising threat posed by cumulative effects of continuing coastal pollution. While the Commission recommendations focus primarily on the enforcement responsibilities of the Environmental Protection Agency, NOAA's coastal ocean science program fills a much-needed coastal measurement and evaluation role. As data are collected over time, trends become obvious, providing environmental managers with tools to assess the effectiveness of pollution-limiting measures.

The coastal ocean science program is likely to benefit substantially from development of new sensors and instruments that can measure physical, chemical and biological parameters of the ecosystems being studied. Consistent with a central recommendation of the Commission, the ocean community recognizes the importance of emphasizing ecosystem-based approaches. CORE supports the requirement that research be peer-reviewed and competitively awarded and recommends that authorized funding for coastal ocean science follow the general Commission recommendation for doubling the research budget.

Marine Research

Similar to other CORE-supported and Senate-approved legislation, the Marine Research Act would provide the legislative framework for a unified national investment to improve the understanding of the interaction of humans and the marine environment. The bill clarifies the responsibility of the National Science and Technology Council for coordinating interagency research efforts and requires development of an implementation plan that builds on ongoing federal research agency efforts, including those of NOAA, the National Science Foundation, and the National Institute for Environmental Health Sciences. Of primary importance, the plan would provide focus for a new interdisciplinary research program that relies on the capabilities of our nation's academic research institutions and is consistent with the recommendations of the National Academy of Sciences and the Commission. CORE endorses the call for building new and non-traditional partnerships among federal research agencies and with the academic community. This approach could yield major new breakthroughs that will help us better understand the relationship of the oceans to public health, mitigate adverse impacts like harmful algal blooms and water-borne diseases, and develop new products from the sea.

CORE also has supported the creation, within NOAA, of an initiative on the oceans and human health, named the Marine Research Initiative in H.R. 4546. Among the important elements of the NOAA initiative are the establishment of national centers of excellence, competitive research grants, distinguished scholars and traineeships. The program offers real promise for building stronger partnerships among NOAA scientists and academic researchers and opportunities for progress in such fields as marine genomics and ecological chemistry. A major part of improving interagency and extramural cooperation

is simply crossing the organizational lines that separate them. Traineeships and scholarships for pre-doctoral and post-doctoral students, as well as distinguished scholar appointments accomplish that goal, preparing better trained scientists and breaking down barriers between institutions, employees and scientific disciplines.

Ocean and Coastal Observing Systems

The oceans play a critical role in regulating climate and weather, stimulating our economy, buttressing national security and providing choice locations for work and play. Annually over $700 billion in goods move through our ports; $28 billion is netted by the commercial fishing industry; $20 billion by marine anglers; and another $30 billion by recreational boaters. While we extract substantial value from the oceans, our knowledge of how this economically important and life-giving system works is limited. In addition, human-caused environmental change adds another layer of complexity and unpredictability. What is needed is a system that can measure the oceans' vital signs, an Integrated Ocean Observing System (IOOS). Science and technology have made such a system possible; now national and global environmental, economic and national security issues make it imperative.

IOOS will provide measurable benefits to:

- Monitor coastal pollution
- Understand connections between oceans and human health
- Support homeland defense and protect against terrorist attacks
- Measure and explain both human-caused and natural environmental change
- Warn and protect against marine hazards
- Provide better information to support sustainable resource management
- Understand ecosystem-level interactions and changes, thus making ecosystem-based management possible
- Measure and explain climate change
- Provide data that can be turned into value-added products benefiting marine transportation, aquaculture, fisheries, offshore energy extraction and recreational users of oceans and coastal areas.

Today, we stand at a developmental confluence that should promote implementation of IOOS. Evolving technologies in computers, information management systems, communications, sensors, and platforms – combined with recognition of interrelationships among the oceans' physical, biological and chemical systems and topped off by mounting evidence that human activities could have significant and unpredictable impacts on the global environment – are creating both opportunity and imperative for IOOS.

The ocean science community strongly supports the creation of an integrated system that extends from watersheds to coasts to the outer edge of our exclusive economic zone, as well as providing critical global coverage. Enactment of ocean observing legislation has been a priority for CORE since it was established in 1994. Following the release of the Commission's preliminary report, CORE member institutions have worked to make proposed legislative provisions consistent with the relevant Commission

recommendations. While we support the ocean observing provisions in H.R. 4546, we would like to work with you to ensure that they reflect both the Commission's views and recent domestic and international progress in planning for IOOS.

While many of the functions of IOOS will ultimately serve operational purposes, the path to that goal will involve significant investments in research and development. Here again, it is important to note the importance of fully integrating science, operational systems and information systems from design through operation and evaluation. Scientists must be involved throughout the process, not just in the initial gathering of requirements. The member institutions of CORE are the source for much of the research expertise and capabilities that will be required for development of a fully operational system and have endorsed merit-based competition for allocation of available funds. The ocean community represented by CORE supports H.R. 4546 in calling for 51 percent of the funds appropriated for regional observing systems to be made available as grants for the development and implementation of regional coastal observing systems.

A critical subset of the ocean observing system that already exists is the evolving network of coastal observing systems. Many of the existing and planned regionally-based coastal ocean observing systems are the result of the planning and work of consortia of academic institutions, federal and state agencies, non-governmental institutions and private industry. These regional associations design, operate and improve regional coastal observing systems. The next step is to establish an information management mechanism that connects all regional associations to a common national backbone in a way that makes all data accessible and usable to all intended users. The task of ensuring interoperability and accessibility must be planned, coordinated and carried out at the federal level.

Finally, if our goal is to establish a "national weather service" for the oceans, we must recognize the federal role in integrating and maintaining an operational observing system. Without a definite plan to ensure that we maintain the "I" in IOOS, we run the risk of ending up with a regionally effective, but nationally dysfunctional patchwork of systems that will not meet our national needs. Other agencies, including the National Science Foundation, the National Aeronautics and Space Administration and the Navy, also will have critical IOOS responsibilities and all must work together.

Responses to Committee Questions

1. NOAA's largest problem is that it has never fully developed its potential as the nation's integrated ocean and atmosphere agency. Its organizational fragmentation prevents effective implementation of an agency strategic plan and reduces NOAA to a team of high-performing players who have limited effectiveness as a unit. While many aspects of the problem can be addressed in legislation, some of the challenges facing NOAA are closely linked to its history, bureaucratic culture and administration.
2. The Ocean Commission report offers a good starting point for discussion of NOAA's missions, functions and organization. Clear articulation of those attributes would be a major accomplishment for an organic act.

3. With respect to organizing NOAA around its mission areas, H.R. 4607 (the Administration bill) does not specifically address the three primary functional lines recommended by the Commission. H.R. 4546, while not explicitly changing the existing line office structure, does make possible restructuring from subject-defined line offices to function-defined entities. Again, the rationale for such a restructuring would be to align the agency's mission with the Commission's guiding principle of ecosystem-based management. The ocean research community agrees with the emphasis placed by the Commission on ecosystem-based management and recognizes that successful implementation of ecosystem-based management will depend on NOAA's ability to make such a paradigm shift.

   CORE appreciates the important role that NOAA plays as the nation's ocean agency and supports actions that help NOAA forge a cohesive corporate identity and more closely align its functions with its mission. The primary drawback to the proposed restructuring is likely to be the difficulties inherent in any large organization making major changes while maintaining critical service levels and activities.

4. As stated earlier in this testimony and in the attached letter of support, CORE strongly supports creation of the Deputy Assistant Secretary for Science and Technology.

Conclusion

Following the unambiguous wake-up call issued by the Watkins Commission, this nation must recognize that the time has come for constructive action to explore and protect our oceans. We applaud the Committee's efforts to provide NOAA, our nation's ocean agency, with a clear, forward-looking and attainable mission and organization. With adequate funding to support NOAA's important work and community buy-in for its mission, the bill lays the foundation for a reinvigorated NOAA that can protect, understand, and make wise use of the nation's ocean resources. Mr. Chairman, Members of the Committee, on behalf of all the CORE member institutions, I thank you for the opportunity to come before this Committee to present our views.

II. SUMMARY OF THE NOAA RESEARCH REVIEW TEAM REPORT

Both the Senate and House legislative reports accompanying the fiscal year (FY) 2004 NOAA appropriations bills raised concerns about the structure and conduct of research within its Office of Oceanic and Atmospheric Research. NOAA was directed to report to the Appropriations Committees on how OAR could be reorganized, including the options of consolidating facilities or breaking the line office into its constituent parts. NOAA responded to these Congressional directives by asking its Science Advisory Board to establish a Research Review Team headed by Dr. Berrien Moore. The six-member team was asked to address five issues: (1) the effectiveness of OAR research in supporting NOAA; (2) OAR links with NOAA's operational line offices and the Program Planning and Integration Office; (3) a comparison of OAR management structure and process with those of other research agencies; (4) the effect of OAR lab consolidation on the scientific program; and (5) potential savings and efficiencies as a result of lab consolidation.

In undertaking the charge from the Science Advisory Board, the Review Team felt that it was essential to consider the full breadth of the NOAA research enterprise to better understand and evaluate NOAA research and the OAR line office. They also took into consideration three items that directly affect NOAA research: the Climate Change Science Program, the Global Earth Observing System of Systems, and the Ocean Commission's preliminary report.

The Review Team released a preliminary review on January 29, 2004 and a draft report for public comment on May 26, 2004. The comment period for the draft report concluded on June 25 and the Review Team revisions are being made based on the comments received. The final report is planned for presentation to the Science Advisory Board on July 13.

The Review Team proposes a set of principles to guide recommendations for ensuring research excellence, to invigorate the transfer of research into operations and information services, to ensure use of the best research as the scientific basis for regulatory advice, and to enhance information services. The team's findings and recommendations fall into 9 general categories summarized below:

- **Research Plan and NOAA's Mission.** NOAA should develop a Research Vision that supports the agency's strategic plan and extends 20 years providing broad guidance and direction. In close consultation with the external community, NOAA should develop a five-year, agency wide Research Plan that clearly articulates research goals and projects in a phased approach.
- **NOAA Research Organization.** A distinguished and experienced person should serve as Associate Administrator for Research, reporting directly to the NOAA Administrator and with budget authority for all NOAA research. The individual should chair the Research Board, a standing committee of the NOAA Executive Council with responsibility for implementing the Research Vision. To support the Research Board, each line office should establish a senior manager for research who would serve on the Research Council chaired by the OAR Assistant Administrator.

- **Transitioning NOAA Research to Operations and Information Services.** NOAA must strengthen the transition of research to the operational lines through such mechanism as science and technology infusion plans within the lines. The Research Plan should address directly the transition of research to operational products and services, clarifying that both research and operational programs share fiscal and programmatic responsibility for transition. The Research Board and Council should ensure that the plan is well executed.
- **Research Location within NOAA.** NOAA should develop a clear set of criteria for determining the location of research programs within the agency. The criteria should be applied to new programs immediately and to existing programs over a two-year period, based on a review by the Research Board. NOAA should establish an external task force to evaluate the structure and function of ecosystem research within the line offices.
- **Extramural Research in NOAA.** The importance of extramural research requires documentation and articulation to the Department of Commerce, the Office of Management and Budget and the Congress. The role of extramural research should be clearly defined in the Research Vision and Plan and should be an integral part of NOAA's presentation to all those involved in the budget process. NOAA must improve its business practices related to extramural research, engaging the external community early in the planning process through conferences and symposia, as well as establishing more consistent administrative processes. The Science Advisory Board should provide leadership.
- **Cooperative Research in NOAA.** NOAA should establish a process for establishing and maintaining joint institutes and other cooperative arrangement with extramural partners. The process should include approach-specific criteria such as demonstrated commitment, unique capabilities, termination criteria and a well-developed business plan.
- **Reimbursable Research in NOAA.** NOAA should review its policies and procedures for the management of reimbursable funding and develop and implement clear guidelines to better manage it.
- **Research Organization within OAR.** Within OAR, each laboratory should have a clearly defined mission statement establishing priorities that are linked to NOAA's strategic plan, research vision and research plan. The OAR head should establish a single administrator with budgetary and programmatic authority for its laboratories and joint institutes.
- **Research Organization within OAR Boulder Laboratories.** There should be a consolidation of the OAR laboratories in Boulder, CO, into a single center.

The Research Review Team envisions real change in the NOAA research enterprise. Following these recommendations with regard to structure, operations and organizational culture, the team believes that NOAA can and must move from the current fragmented set of science and research programs to a more integrated approach. This corporate enterprise will be led from the Administrator's office through the new 'Associate Administrator for Research' and guided by a strong, regularly updated and detailed

research plan. A Research Board comprised of the senior managers from each line office should manage the agency-wide research program. The Research Council should serve as a working group of the Board to help develop the details for implementing the research plan across the agency.

The NOAA research enterprise must move forward with a much stronger corporate purpose and direction and a significant change in culture; the various research programs must be more closely coordinated so that they support and leverage one another regardless of line office affiliation. Research must be responsive to the overall vision and mission of the agency including the operational and regulatory missions. It must be connected to the scientific enterprise as a whole including the scientific advisory functions and the users of science. The Research Council and Board must continually monitor and guide the interaction between research and operations, mindful of the balance between research "push" and operations "pull". There must be an explicit effort to address this balance to ensure that the best research products of the agency are fully utilized in each of the many areas of responsibility of NOAA.

In a changed culture for research in NOAA, research must be valued and supported for its long-term impact, even in the presence of critical near-term needs. At the same time, research must not be "set apart" or isolated from the overall mandates of the agency. There must be extensive, continuous interaction between the research enterprise and operation efforts to ensure that NOAA programs are science-based now and in the future. This means that the culture of the agency must recognize that today's decisions and programs must be based on the best available science supported by the very best researchers. In addition, NOAA must ensure that mid and long-term research is supported to develop the science that will support future decisions and programs.

The NOAA research enterprise must become fully engaged with the extramural community from academia, the private sector and other agencies. This means more than just an advisory board, but a true change in how NOAA manages extramural funding, develops and maintains cooperative institutes and programs, and contributes to broader research efforts nationally and internationally. Extramural researchers have enormous contributions to make to NOAA's mission and NOAA can similarly have a major impact on external research programs. NOAA must become a "best partner" for the external science and research community.

Overall, the Team believes that the NOAA research enterprise must be both cohesive and expansive. Internally, the program elements must work together with common goals and objectives. Externally, NOAA must welcome, support and fully engage in research efforts with partner agencies, academia and the private sector. We believe there is great opportunity for a good NOAA research program to become much better and be our national leader in ocean and atmospheric research.